

The value, even of the results hitherto obtained (and they are few in comparison with the results which it is yet hoped to obtain), is really beyond estimate. That the high importance of scientific inquiry is now generally recognised in South Africa is demonstrated, not only by the confidence which is now shown throughout the country in the men who have obtained the results to which I have referred, but by the establishment and flourishing growth in South Africa of our own Association for the Advancement of Science, which includes in its ranks not only men who have made some branch of science their life-study, but many who, like myself, cannot pretend to the possession of accurate scientific knowledge, but are deeply impressed with the value to this community of the promotion of scientific inquiry and research.

I have dwelt at length on the subject of the efforts of science in the matter of combating disease because it is an aspect of the question of the advancement of science which more particularly and immediately affects the practical interests of the majority of the South African community. To survey the whole field would be impossible within the available limits of time, and without exhausting the patience of my audience, even if my acquaintance with the various subjects were sufficient to justify me in dwelling on them. I should like, however, to bear my testimony to the unselfish devotion to the cause of science which is customarily shown by scientific workers in South Africa, in whatever branch of science they may be interested. In these days of scrambling after fortune, the unrewarded or scantily rewarded efforts of men searching after scientific truth with the "obstinate humility which is the crown of genius" should compel our respect, our admiration, and our material, no less than our moral, support.

I say material support, for however unselfish scientific inquirers as a class may be, however ready to devote themselves to their work without special pecuniary reward, they are not, as a rule, men of private means, and it is necessary that they should at least be provided with a sufficiency of bread and butter. Scientific research is necessarily slow. It may be years before any particular line of inquiry leads to a practical result. Long and costly inquiries, such as Koch's inquiry into east coast fever, may even have only a negative result. If, therefore, scientific research is to be pursued in South Africa in the thorough manner in which it ought to be pursued, it should be endowed in some form or other. Such endowment may come either from public sources, so that all the tax-payers contribute to it, or from private sources. It is not for me to prescribe or to suggest from which source it should come. I merely indicate the necessity. I would not, however, wish it to be understood that the South African Governments have neglected their duty in the matter of promotion of scientific research. Far from it. In Cape Colony, the Grahamstown Laboratory, where much useful work was done by Edington, was established seventeen years ago, and has since been considerably enlarged. A laboratory and experimental station, in which Lounsbury carried out those remarkable investigations which proved that the Bont tick was the carrier of heart-water, and arrived at other exceedingly valuable and interesting scientific deductions, has been established at Rosebank. The Natal Government has established a laboratory near Maritzburg, at and in connection with which Watkins Pitchford and his assistants have done much useful work, notably by making the discovery that horses could be protected against horse-sickness by the exclusion of biting insects, and in the preparation of anti-toxic sera and of anti-venene; and the Transvaal Government, after liberally subsidising Theiler's epoch-making investigations, has recently built an experimental station, at a cost of some 60,000*l.*, which will bear comparison, so far as design and facilities go, with any such station in the world. Added to this, the Cape Government, besides incurring large expenditure on rinderpest experiments, contributed liberally to defray the out-of-pocket expenses of Beattie's magnetic survey, expended large sums on Gilchrist's investigation of South African marine biology, and joined with the other South African Governments in defraying the heavy cost of Koch's inquiry into east coast fever; and the Zululand Government bore the whole of

the expense of Bruce's nagana investigations. It cannot be said, therefore, that the South African Governments have been backward in this matter. Much has been done, no doubt, but more is wanted.

It is not only in connection with the investigation of diseases that research is required. It is, no doubt, the practical value of that particular line of research which has contributed in a large degree to the popularisation in South Africa of the advancement of science. But it is the educative side of scientific research that will in the end prove of the highest and most permanent value to the community. That fact has been recognised by the Transvaal Government, which has provided, in its new experimental station, for the training of students, and a small commencement has been made in the matter of training research students in the laboratories of some of the colleges in Cape Colony.

NOTES.

WE notice with deep regret the announcement of the death of Prof. Henri Becquerel at the age of fifty-six.

AN international congress is to be held at the photographic exhibition which is being arranged to take place at Kiev from December 15, 1908, to January 15, 1909.

DR. ERIC A. NOBBS, agricultural assistant to the Cape Government, has been appointed director of agriculture in Rhodesia.

LIEUT.-COLONEL BOURGEOIS, chief of the geodetic section of the French Army Geographical Service, has been appointed professor of astronomy and geodesy in the Paris Ecole polytechnique in succession to M. Poincaré, who has resigned.

THE herbarium formed by Mr. Duthie, and hitherto quartered at Saharanpur, has been transferred to the Imperial Forest Institute, Dehra Dun; any correspondence in connection with it should be addressed to the Imperial forest botanist of that institute.

DR. W. H. WILLCOX, lecturer on public health, pathological chemistry, and forensic medicine at St. Mary's Hospital Medical School, has been appointed senior scientific analyst to the Home Office in succession to the late Sir Thomas Stevenson.

THE British committee of the first International Congress of the Refrigerating Industries (Congrès international du Froid), to be held in Paris on October 5-12, at the Sorbonne, has issued a programme of British papers and resolutions to be brought before the congress. The various sections and the presidents are as follows:—I. Low Temperatures and their General Effects, Prof. d'Arsonval; II. Refrigerating Appliances, Prof. H. Léauté; III. The Application of Refrigeration to Food, M. A. Gautier; IV. The Application of Refrigeration to other Industries, M. E. Tisserand; V. Application of Refrigeration in Commerce and Transport, M. Levasseur; VI. Legislation, M. J. Cruppi. Lectures will be given by Prof. von Linde on refrigeration in dwelling places, and Prof. d'Arsonval on liquid air and very low temperatures. Further particulars can be obtained from the secretary of the British committee of the congress, 3 Oxford Court, Cannon Street, London, E.C.

A COMMITTEE is being formed to erect a monument to the late Prof. K. von Than, of the University of Vienna, whose death was announced recently. The monument will be set up at Ó-Beeze, in Hungary, where Prof. von Than was born.

THE Oklahoma constitution contains a provision making it obligatory upon the legislature to establish a geological survey. The first State legislature passed a law placing the survey under the control of a commission consisting of the governor, the State superintendent of public instruction, and the president of the State University. We learn from *Science* that the sum of 3000*l.* was voted for the work, and that the commission has now elected Dr. Charles N. Gould, head of the department of geology in the State University of Oklahoma, to be director of the survey. Dr. Gould has been instructed to report on the building stone, road material, and oil and gas of the State.

DR. E. F. ARMSTRONG, Recorder of Section B (Chemistry) of the British Association, informs us that the following papers have been promised in addition to those already announced (July 30, p. 299):—the liquefaction of helium, Prof. Kamerlingh Onnes; anticipations and experiments on the liquefaction of helium, Sir James Dewar, F.R.S.; note on a volatile compound of cobalt with carbon monoxide, Dr. Ludwig Mond, F.R.S., and others. We are also informed that additional papers to be read in Section G (Engineering) are:—a clock-driving mechanism for equatorial telescopes, Sir Howard Grubb, F.R.S.; experiments on rotating discs, J. Brown, F.R.S., and M. F. Fitzgerald; strength of solid round-ended columns, W. E. Lilly; the study of breakages, W. Rosenhain.

As announced already, the autumn meeting of the Iron and Steel Institute will be held at Middlesbrough on September 28 to October 2 under the presidency of Sir Hugh Bell, Bart. The following are among the subjects of papers offered for reading:—scientific control of fuel supply, Prof. H. E. Armstrong, F.R.S.; metallurgy at the Franco-British Exhibition, H. Bauerman; gas-producer practice, Prof. W. A. Bone, F.R.S., and Dr. R. V. Wheeler; the constitution of carbon steels, Prof. E. D. Campbell; the freezing point of iron, Prof. H. C. H. Carpenter; the production of finished iron sheets and tubes in one operation, S. O. Cowper-Coles; the chemical control of the basic open-hearth process, A. Harrison and Dr. R. V. Wheeler; the influence of silicon on the physical and chemical properties of pig iron, A. Jouve; analysis and synthesis in the foundry, J. E. Stead, F.R.S., and T. Westgarth.

ACCORDING to a *Times* correspondent, Dr. Lee De Forest expects that within two years Paris and New York will be in direct wireless telephonic communication. An apparatus which may ultimately transmit and receive messages to and from the Eiffel Tower is to be installed upon the 700-foot tower of the Metropolitan Life Insurance Company of New York. It is reported that Dr. De Forest estimates the radius of his apparatus, when installed at an adequate height, to be about 1000 miles, but he is now working at certain improvements which he thinks will make possible Transatlantic communication. The installation on the Metropolitan tower will probably be ready by the end of the year, and the first object will be to send bulletins to ships equipped with the radio-telephonic and telegraphic apparatus. Dr. De Forest says that the length of the wire which he means to install will admit of the employment of a wave of a length long enough to be inaudible by any ordinary apparatus unless specially tuned to catch it. It is also reported by the *Times* that communication has been established by wireless telephony between the Eiffel Tower and the Pointe Duraz, on the coast of Brittany, south of Brest, a distance of more than 500 kilometres. The transmitter used at the Eiffel Tower consists of a Poulsen singing arc producing more than a

million waves a second. The receiving apparatus includes the usual aerial wire and Captain Ferrée's electrolytic detector.

IN the *National Geographic Magazine* for August, Mr. L. G. Blackman, principal of Alluolani College, Honolulu, describes an ambitious scheme for the organisation of the Pacific Scientific Institution in that island, which has for its object the investigation of the Pacific Ocean, "the most explored and least known region of the globe." It is proposed to dispatch from this centre parties of trained explorers in a specially equipped vessel to the various island groups. The programme includes the collection of anthropological data; the languages, religions, laws, mythologies, legends, and genealogies will be recorded; technology, arts, and medicine will be studied; series of mammals, birds, reptiles, and botanical specimens will be collected; the coral reefs, marine fauna and flora, ocean currents, geology, and meteorology will be investigated. The survey, it is estimated, will occupy fifteen years, at the end of which reports will be issued, and progress bulletins will be published periodically. The scheme also provides for the establishment of a central museum, zoological garden, and marine biological station. Mr. Blackman, in conclusion, states that "the manner in which the institution has been incorporated and the trustees under whose administration it has been placed assure us that the long-delayed work of Pacific exploration will shortly be commenced." The increasing interest of America in the future of the Pacific will doubtless encourage her to detail for this work the many trained explorers at her disposal. The results of this important scientific survey will be awaited with interest.

A RECENT issue of *Science* contains particulars of the appropriations for the U.S. Department of Agriculture for the ensuing year. The grand total of grants amounts to 3,132,021*l.*, which is an apparent increase over the previous year of 480,163*l.*, or about 15 per cent. A large part of this increase, however, is only nominal, since for the present year more than 200,000*l.*, derived from receipts from forest reserves, is available. The net increase is distributed through all sections of the department, and notably larger sums are available for the management of the national forests, the pure food and drug inspection, the campaign against the gipsy moth and cattle tick, and for additional buildings and equipment on the forest reserves and for the Weather Bureau. Provision is made for new investigations, and among these may be mentioned the inauguration of evaporation investigations and of studies of the prevalence and extent of tuberculosis among dairy cattle, the inspection of foods intended for export under certain conditions, and the manufacture of denatured alcohol in small amounts under farm conditions. Among the appropriations, we notice 14,000*l.* for purchasing, fencing, &c., some 12,800 acres of the Flathead Indian Reservation in Montana for a permanent national bison range, for a herd of bison to be presented by the American Bison Society. The Weather Bureau is to receive 332,452*l.*, an increase of 49,744*l.* Of this amount, 12,000*l.* is for the erection of a main observatory building at Mount Weather, Va., to replace that destroyed by fire on October 23, 1907. The Bureau of Animal Industry is to benefit by 216,172*l.*, an increase over last year of 9660*l.* The emergency appropriation for the eradication of the cattle tick in the south is increased from 30,000*l.* to 50,000*l.* The Bureau of Plant Industry receives an apparent net increase of 57,900*l.*, and the Bureau of Chemistry an increase of 25,760*l.*, chiefly for additional expenses incident on the enforcement of the National Food and Drug Act.

The appropriation for the Bureau of Soils is increased to 46,940*l.*, that of Entomology to 36,992*l.*, while the total appropriation for the Office of Experiment Stations is 206,924*l.*, an increase of 4280*l.*

ACCORDING to the report for 1907, the Albany Museum, Cape Colony, continues to make steady progress, but the congested condition of the collections, owing to insufficient accommodation, necessarily tends to hinder expansion. By the death of Mrs. George White, of Brakkloof, near Grahamstown, the museum has lost a liberal and constant benefactor.

IN vol. xvii., part v., of the Proceedings of the Royal Physical Society of Edinburgh, Prof. J. A. Thomson records from the Færoes a large antipatharian coral hitherto unknown from the British area, and provisionally identified with a well-known Mediterranean species, which has been stated to occur in the Bay of Biscay. The single Færoe specimen, which is more than a yard in height, was dredged up by a fisherman.

FROM the author, Mr. M. Doello-Jurado, we have received a copy of an "Essai d'une Division Biologique," extracted from *Annales de la Sociedad Cientifica Argentina*, vol. lxxv., pp. 189 *et seq.*, 1908. In this it is proposed to divide vertebrates into two main groups, according to their mode of fecundation. In the one group fertilisation of the ovum takes place within the body of the female parent, while in the other this process is external. "Vertébrés à fécondation interne" are further divided into an oviparous and a viviparous subgroup.

IN the double July and August number of *Naturen*, "J. G." records the capture of a specimen of Sowerby's beaked whale (*Mesoplodon bidens*) at Bergen. These cetaceans seem much less uncommon on the coasts of Norway than on our own shores, three specimens having, to our own knowledge, been taken at Bergen during the last few years. The new specimen is unusually small, and probably, therefore, immature, its length being only 2.45 metres, whereas normally adult examples attain about double this length.

TO Mr. B. B. Woodward we are indebted for a separate copy of his presidential address delivered before the Malacological Society in February last, and published in vol. viii., part ii., of the society's Proceedings. The title is "Malacology versus Palæoconchology," and attention is specially directed towards an alleged lack of harmony existing between the works of students of recent and of fossil Mollusca. Workers in the existing group are accordingly asked to check their results by a comparison of the labours of palæontologists, while the latter are urged to desist from the practice of brigading together groups which have been shown by the former to have no near relationship. A useful table of the time-distribution of the leading molluscan groups is appended.

TO the August number of *British Birds*, Mr. C. B. Ticehurst contributes the results of an inquiry into the recent outbreak of wood-pigeon diphtheria, of which the distribution is illustrated by a map. The disease, it appears, has been familiar to sportsmen and gamekeepers for some years as being liable to occur in seasons when acorns and beech-mast are abundant, but its true cause was unknown. The disease was in the main confined to the Thames valley area, and appears to have been most prevalent among the migratory birds which arrived in autumn from the Continent. It is suggested that the contagion was communicated by one bird swallowing food that had been coughed up from the gullet of another. The course of the

malady may be either rapid or lingering. The active cause of the disease is the presence in the mucous membrane of the throat of a bacillus believed to be specifically distinct from the one which causes diphtheria in the human subject.

THE second part of vol. xci. of *Zeitschrift für wissenschaftliche Zoologie* contains a very detailed account of the minute structure of the eyes—compound and simple—of the fresh-water crustacean *Apus productus*, by Dr. W. Wenke, of the Zoological Institute, Berlin. The investigation was taken up as a further development of Hesse's "Untersuchungen über die Organe der Lichtempfindung bei niederen Thiere." Without entering into the results of the investigation, attention may be directed to the elaborate nature of the text-figures illustrating the histology of the compound eyes. Incidentally, it may be mentioned that *Apus productus* seems to be as capricious in its appearance as the British *A. cancriformis*. In 1901 females were, for instance, abundant in the neighbourhood of Berlin, but for several years afterwards the author could obtain no other specimens until he found the species common at Fürstenbrunn in 1906 and 1907. Owing to the cold spring the species at that place has this year attained only two-thirds its normal size.

Few food problems are more important than the development of bacteria in milk, and the dairy farmer is fast recognising that micro-organisms are the cause of many of his troubles. Elaborate apparatus has been devised for cooling, pasteurising, and sterilising milk, and is being used to a large and increasing extent in modern dairies. Bulletin No. 111 of West Virginia University Agricultural Experiment Station gives a full description, with illustrations, of some of the methods used in America, and will prove very useful to those interested in the technical side of bacteriology.

AN interesting batch of bulletins has reached us from the Agricultural Experiment Station of the Purdue University (Indiana, U.S.A.), some dealing with local practical problems and others of more general interest. In No. 119 is given a list of the plant diseases occurring in the State for the year 1906, with an indication of their relative prevalence. The basis for the estimation of losses and the distribution of the diseases was a large number of reports furnished by correspondents all over the State. The value of such a list, both from the scientific and the economic point of view, is obvious, and some of our agricultural institutions would do well to draw up similar lists for the areas they serve.

A NUMBER of the "Progressus Rei Botanicae," prepared by Dr. J. W. Moll, and published for the International Association of Botanists, is devoted to the review of the progress in microscopic technique since the year 1870. With regard to the microscope and its component parts, water immersion objectives were already in use prior to that date, but oil immersion objectives are innovations and apochromatic lenses are more modern. The author regards the Abbé condenser and revolving nose-pieces as the most practically useful devices that have been introduced. Allusion is made to the investigation of ultra-microscopic particles and microphotography with ultra-violet light, but more information would have been acceptable. A discussion is presented of the opinions held with regard to the value of fixing and staining methods, in which Dr. Moll disagrees in the main with Fischer's criticisms. It is noted that the method for preparing paraffin sections in ribands was first announced by F. Spee in 1885. Reference is made to certain physical tests, of which De Vries's plasmolytic method is the best known.

THE failure of Scots pine when planted on farm lands has been so pronounced in many parts of the Continent that the matter was referred to Prof. Albert for investigation. Mr. B. Rippentrop furnishes an account of the work, so far as it has gone, to the Transactions of the Royal Scottish Arboricultural Society (vol. xxi., part ii.). There is no difficulty in connecting the failure with the fungus *Polyporus annosus*, but the question remains whether the fungus is the primary cause of the disease. On forest lands, although the *Polyporus* is present, the trees do not suffer, and it appears that the difference lies in the physical condition of the soil. On farm lands it was observed that nearly all the trees showed disease of the roots, and it is inferred that when the trees are thus weakened they fall a prey to the fungus. The interplanting of hard-wood trees, notably of species of *Acacia*, leads to an improvement of the soil by which the conifers are benefited.

THE Upper Gila and Salt River valleys of Arizona and New Mexico, the antiquities of which are the subject of a monograph by Mr. Walter Hough in the thirty-fifth Bulletin of the Bureau of American Ethnology, form part of the States of south-eastern Arizona and south-western New Mexico, close to the southern boundary of the Republic. This region at one time provided a home for numerous hunting and pastoral tribes, some inhabiting the higher forest belt, which now constitutes the greatest virgin forest remaining in the United States, others cultivating the fertile valleys watered by the streams which descend from the higher ridges. The abundant remains of cliff dwellings, pueblos, and the cemeteries in which the inhabitants buried their dead, prove that this country was at one time thickly peopled. When and why they disappeared is not known; it was certainly prior to the famous exploration by Francisco Vasquez Coronado in 1540. Large collections of their pottery, clothing, and other manufactures have been made from the numerous cliff dwellings and pueblos which sheltered this now forgotten race. Everything indicates that they had attained a fairly high culture. They must have been able to combine in the construction of works of national importance, as, for instance, in building the gigantic irrigation dam in the Animas valley, New Mexico, an earthwork $5\frac{1}{2}$ miles long and from 22 feet to 24 feet high. Of their language we know as little as of their history, the petroglyphs on smooth rock surfaces showing only rude figures of men and animals, with various symbols which have up to the present defied interpretation. Mr. Hough's report is a good example of the careful work performed by the Bureau of Ethnology.

THE latest additions to the useful and compact series of "Manueli Hoepli" are a volume by Lanfranco Mario on frauds in electrical meters ("Le frodi nei misuratori elettrici"), and one by Prof. Vincenzo Reina, the indefatigable treasurer of the recent Mathematical Congress, on optical instruments ("Teoria degli Strumenti diottrici") (Milan: Ulrico Hoepli, 1908, prices 4.50 and 3 lire respectively). Dr. Lanfranco deals with the problem of "sealing" sources of electrical energy in connection with the Italian Government duty on electric power, and his book treats generally of the question of fraud in the working of electric meters, or in connection with the so-called sealing in question, as well as its means of prevention. Prof. Reina's handbook may be described as an elementary treatise on geometrical optics; it deals with the laws of refraction, the relations between conjugate foci in a system of coaxial lenses and such instruments as the compound microscope, telescope, and photographic lens. The

author's treatment of the subject is simple in character, and does not include elaborate discussions of aberrational and other errors.

WE have received the "Atti della Società italiana per il Progresso delle Scienze," a society which was recently founded on lines similar to the British Association and other organisations of the same kind, and held its first annual meeting in Parma on September 23-28, 1907. The association includes the following sections:—(1) mathematics, astronomy, geodesy; (2) physics, geophysics, meteorology; (3) mechanics, engineering, electrotechnics; (4) chemistry; (5) botany; (6) geography; (7) mineralogy, geology, palæontology; (8) botany; (9) zoology and comparative anatomy; (10) anthropology; (11) anatomy; (12) physiology; (13) pathology and bacteriology; (14) economics and statistics. The present volume contains a summary of the proceedings, together with reports *in extenso* of the inaugural addresses by the Mayor of Parma, Prof. Vito Volterra, president of the association, and the Minister of Public Instruction; the general lectures by Prof. G. Ciamician on organic chemistry in organisms; by Prof. P. Foà, on the biological significance of tumours; by Prof. M. Pantaleoni, a cinematographic view of progress in economic science, 1870-1907; and sectional addresses by Profs. V. Cerruti, A. Righi, L. Luiggi, M. Ascoli, E. Paternò, G. Cuboni, G. dalla Vedova, A. Issel, A. Borzi, A. Andres, G. Sergi, G. Fano. The next meeting will take place in Florence in September of this year.

WE have received the report for 1907 of the Liverpool Observatory maintained at Bidston (Birkenhead) in the interest of shipping by the Mersey Docks and Harbour Board. A signal gun is fired daily at 1h. p.m., and chronometers, sextants, and other apparatus are tested for shipmasters. The meteorological observations are very complete, and include indications from Dines's, Osler's, and Robinson's anemometers. The daily meteorological results show the extreme and mean values, the amount and duration of rain, and the number of hours that the wind blew from each of eight points of the compass. The absolute maximum temperature of the year was $76^{\circ}\cdot 0$, in July, and the minimum $20^{\circ}\cdot 4$, in January: the mean for the year was $0^{\circ}\cdot 7$ below the average. The rainfall was 26.57 inches, practically 2 inches below the average; rain was recorded on 209 days. Among other useful work performed we note that reports are supplied daily to the Meteorological Office for the preparation of its weather forecasts. Some details connected with the records of a Milne seismometer are included in the observatory report.

THE University of Illinois Engineering Experiment Station has recently issued Bulletin No. 23, "Voids, Settlement and Weight of Crushed Stone," by Mr. Ira O. Baker. This bulletin gives the results of some experiments to determine the proportion of voids in crushed stone loaded by various methods in cars and in waggons, to find the amount of settlement during transportation in waggons and in cars, and also to obtain the relation between the weight of a unit of volume of the solid stone and that of the same volume of crushed stone immediately after being loaded in various ways into cars and waggons, and also after being transported different distances. Copies of this bulletin may be obtained gratis upon application to the director, Engineering Experiment Station, Urbana, Illinois.

AN article on "England's Neglect of Mathematics," contributed by Prof. G. H. Bryan, F.R.S., to the August number of the *Cornhill Magazine*, should do something to awake the British nation to a sense of its duties to science.

A number of instances are given of the value of mathematical research, and a plea is made for greater encouragement for mathematicians and more serious work in higher education. For example, as Prof. Bryan points out, "Before the mathematical theory of stability had been developed many ships were sunk and many lives lost which could have been saved if the problem had been properly placed in the hands of the mathematician. It was only after these losses took place that the theory of the meta-centre was finally evolved, and the problem of stability was reduced to one of pure arithmetical calculation. If one-tenth of the money expended in building these ill-fated ships had been offered to a really competent mathematician possessing the highest knowledge of his subject, to enable him to devote his whole time for a year or so to this particular problem, the saving to the community would have been immense. Yet a similar drama may be enacted at the present day in connection with artificial flight, for while the mathematical theory of stability has been outlined there is a great deal of work to be done before the results can be reduced to simple practical rules."

A FORM of cadmium cell suitable for supplying a small current much more constant than can be obtained from a storage cell is described by Mr. G. A. Hulett, of Princeton, in the July number of the *Physical Review*. A wide-necked bottle of about 8 cm. diameter contains a layer of mercury half a centimetre thick covered to a depth of 4 cm. or 5 cm. by a solution of 10 c.c. of strong sulphuric acid and 800 grams of cadmium sulphate crystals per litre of water. A glass tray about 4 cm. diameter and 4 mm. deep is supported in the solution a little above the surface of the mercury, and contains the $12\frac{1}{2}$ per cent. cadmium amalgam. Contact is made with the mercury and the amalgam by means of wires enclosed in tubes. The mercurous sulphate is prepared in the cell by sending a current through the cell from the mercury to the amalgam, the solution being kept well stirred during the process. The internal resistance of such a cell is about 6 ohms, and it is capable of giving a current of 0.00001 ampere for many days without its electromotive force varying appreciably. A larger cell has been used to give a constant current of 0.04 ampere for a long period for bolometrical work.

In the case of the majority of the ions Prof. Arrhenius's assumption that the mobility is independent of the concentration holds good through a considerable range of dilute solutions, though variations occurring in stronger solutions are well known, and have been investigated by Jahn, by Bousfield, and by others. The hydrogen ion appears, however, to be an exception. For some years doubt has existed as to the correct value for its mobility, transference experiments at moderate dilutions having given a value 330, considerably higher than the value 315 deduced from conductivity measurements at extreme dilutions. This discrepancy has been traced by Noyes and Kato, who describe their observations in a recent number of the *Journal of the American Chemical Society*, to variations in the mobility of the hydrogen ion occurring at dilutions much greater than those at which the mobilities of the other ions become constant. Concordant values were obtained from independent observations with hydrochloric and nitric acids, and the evidence for the reality of the variations of mobility appears to be complete. The numbers given in the following table show the magnitude of the changes involved:—

Concentration	(HNO ₃)	0.058	0.0184	0.0067	0.0022	0
	(HCl)	0.051	0.0170	0.0056	0.0021	0
Mobility	(HNO ₃)	350.3	340.2	339.1	332.2	324.6
	(HCl)	344.2	340.5	341.4	331.8	324.0

NO. 2026, VOL. 78]

THE Harben lectures of the Royal Institute of Public Health, delivered by Prof. Paul Ehrlich last year upon the subject of "Experimental Researches on Specific Therapeutics," have been published by Mr. H. K. Lewis, Gower Street, in the form of a small volume, having a portrait of the lecturer as a frontispiece. The price of the volume is 2s. 6d. net.

FOR the third year in succession the Library Association has published its "Class List of Best Books and Annual of Bibliography." The work is a classified and annotated catalogue of important works which appeared in the year ended on June 30. The previous year's issue comprised 1800 titles; this year the number has risen to more than 2500. The publication should be useful both to the general reader and the student as a guide to recent literature of noteworthy value.

THE third edition of Prof. H. Snyder's "Soils and Fertilisers" has just been published by the Macmillan Co., New York. The second edition was reviewed in *NATURE* of January 18, 1906 (vol. lxxiii., p. 266); and though the work has been enlarged and revised, no further description of its contents is necessary. It is sufficient here to say that the book presents in a concise form the scientific principles involved in the successful treatment of the soil and the production of crops.

OUR ASTRONOMICAL COLUMN.

THE ORIGIN OF THE RECENTLY DISCOVERED JOVIAN SATELLITES.—Criticising Prof. Forbes's recent suggestion (*NATURE*, p. 30, No. 2011, May 14) that the newly discovered eighth satellite of Jupiter may in reality be the long-lost Lexell's comet of 1770, captured by the giant planet in 1779, Prof. Tarrida del Marmol conjectures that a more likely explanation of the origin of the sixth, seventh, and eighth satellites is to be found in the suggestion that they are asteroids which revolved at the same distance from the sun as Jupiter, and were captured by the latter. He shows that if the asteroid be either further away from, or nearer to, the sun, the annexation cannot take place, but when the distances are equal the asteroid will, with its relatively negligible mass, be effectively the inferior planet, and will suffer capture. The recent discovery of the four Jovian asteroids Achilles, Patroclus, Hector, and 1908 C.S., strengthens the possibility of this conjecture. Prof. del Marmol concludes his note, which appears in the August number of *Knowledge and Illustrated Scientific News* (vol. v., No. 8, p. 185), with the tentative suggestion that the Saturnian satellites Hyperion, Themis, and Phoebe may have been captured by Saturn in the same manner.

In answer to our inquiries concerning the above suggestions, Mr. Melotte, the discoverer of Jupiter's eighth satellite, points out that the images found on the plates give no indication whatever of diffuseness, such as might be expected from a cometary body, but are in every respect similar to the photographed images of the other faint satellites. According to Hind, Lexell's comet, when nearest the earth, exhibited a white nebulousity surrounding the nucleus and subtending an angle of $2^{\circ} 23'$, although no tail was visible. Mr. Melotte also suggests that others of the major planets may be attended by satellites hitherto undiscovered by reason of their faintness, and that the motions of these may subsequently be found to be retrograde, thus reducing the importance of the anomalies which have hitherto puzzled astronomers in considering the origin of the satellites under discussion. In conclusion, he adds that possibly Prof. del Marmol intended to write Japetus in place of Themis, as, so far as is known, the latter rarely reaches a distance of $220''$ from Saturn.

ELEMENTS OF THE ORBIT OF JUPITER'S EIGHTH SATELLITE.—Circular No. 102 from the Kiel Centralstelle contains the following equatorial elements for the orbit of Jupiter's eighth satellite, computed by Messrs. Crawford and Meyer